

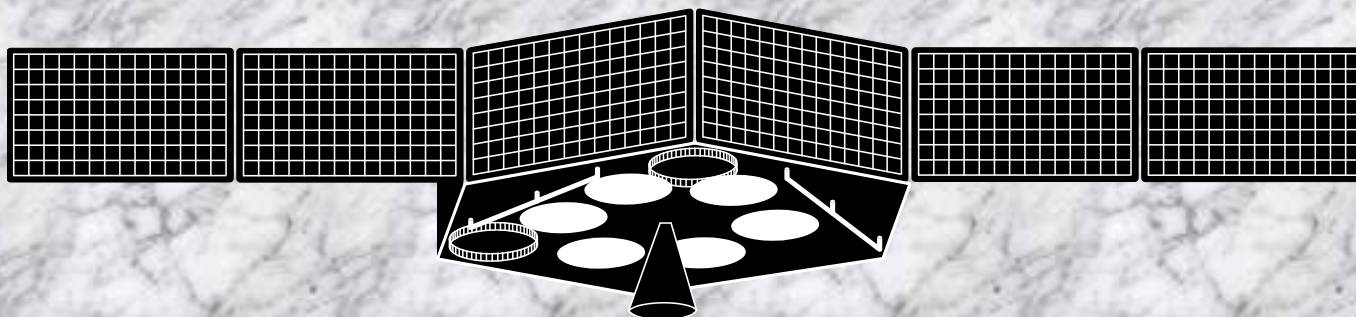


Amsat Oscar 40

**World Wide Amateur Radio
Satellite Communications**

Presented by Stanley Gixti 9H1LO

www.9h1lo.com





A Brief History of AO-40 so far...

- **AO-40 was initially known as Phase 3D, or P3D. It's the fourth amateur Phase 3 satellite, hence the 'D'.**
- **Phase 1 amateur satellites were designed to last only a few weeks, having either no or limited means of power replenishment during orbit.**
- **Phase 2 satellites are in a Low Earth Orbit (or LEO), and lend themselves to communication over distances up to 4,000 miles or so.**
- **Phase 3 satellites are designed to operate over much longer distances because for most of their highly elliptical orbit they are at a much higher altitude than the LEO's.**

AO-40 is the most complex and feature laden amateur satellite ever flown.



A Brief History of AO-40 so far...

- When launched on November 16 2000, AO-40 seemed to be working correctly, or 'nominally', except for the 70cm transmitter.
- Soon after being launched, the satellite started beacon transmission of telemetry data on the 2m band. And it sounded *very* loud!
- AO-40 was left in an elliptical orbit, essentially in the same plane as the equator, as expected. For optimum use, the preferred orbit needed to be changed somewhat.
- On December 13 2000, during some orbital manoeuvres using the 400N motor, AO-40 went silent.
- To sighs of relief across the globe, on 25 December 2000 the 2401MHz (S band) beacon was switched on successfully, but a number of systems were now not working correctly, in particular the 2m transmitter
- Despite the setback, on May 5 2000 the transponder (the device allowing two-way communication) was switched on for a trial period until 30 May 2000. With reports from around the globe of worldwide contacts, this proved the satellite to be an unmitigated success.
- Some further orbital manoeuvres ensued starting 21 June 2000, this time using the a second motor: the Arcjet (or ATOS). Designed for smaller orbital changes than the 400N motor, over a few orbits the Arcjet was programmed to fire for a couple of hours at perigee.
- On 30 June 2000, the Arcjet firings were finished, and AO-40 was in a slightly better orbit, but unexpectedly all of the fuel had been consumed.



Common myths and excuses about AO-40

- **The equipment is too expensive**
- **You need specialist microwave skills**
- **You need expensive specialist tools and test equipment**

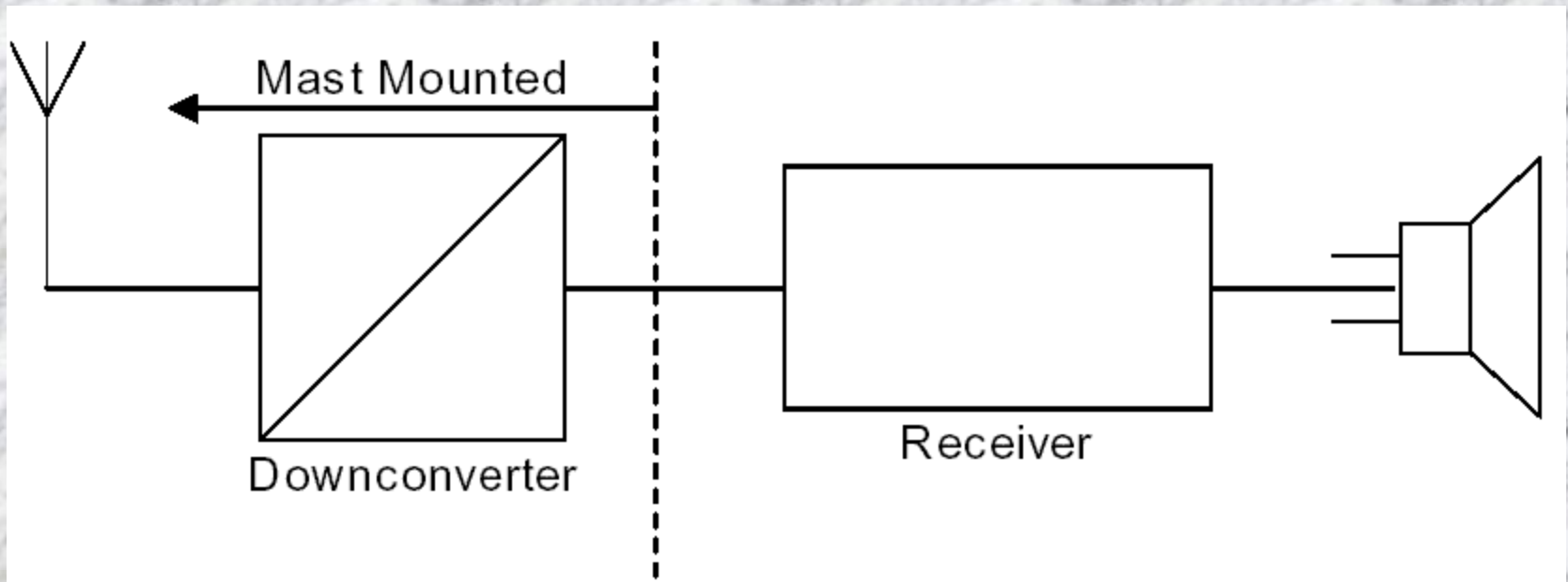
This is all untrue!!

**Any self respecting radio amateur probably already
has most of the equipment needed to work
AO-40 !!!**

Basic equipment needed

Receiver setup

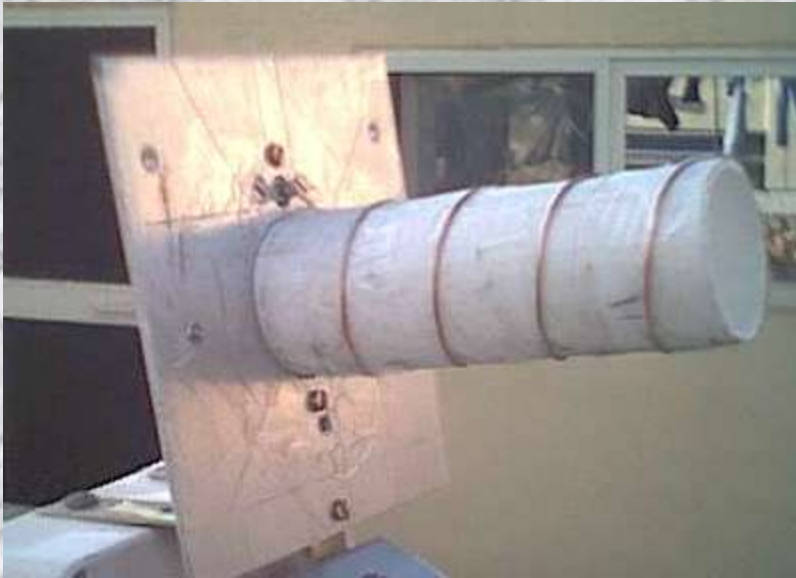
- Antenna
- Downconverter
- Receiver



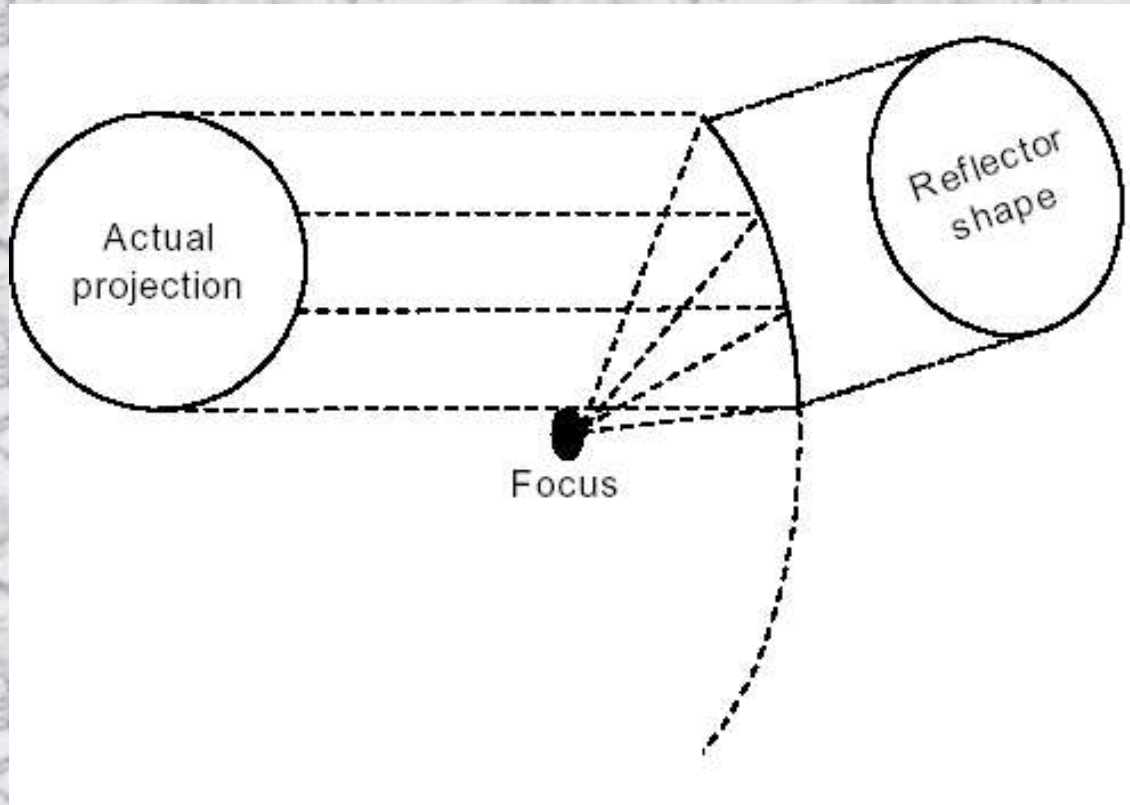
Basic equipment needed

Receive Antenna

- 60cm TVRO Offset Fed Dish
- Helix antenna



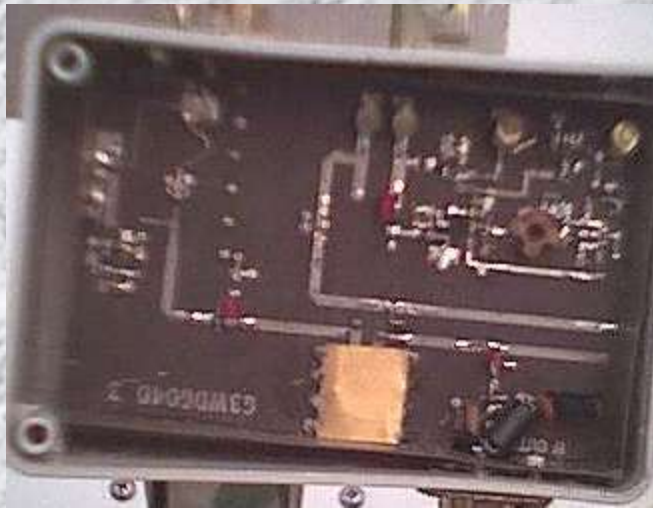
About Offset dishes



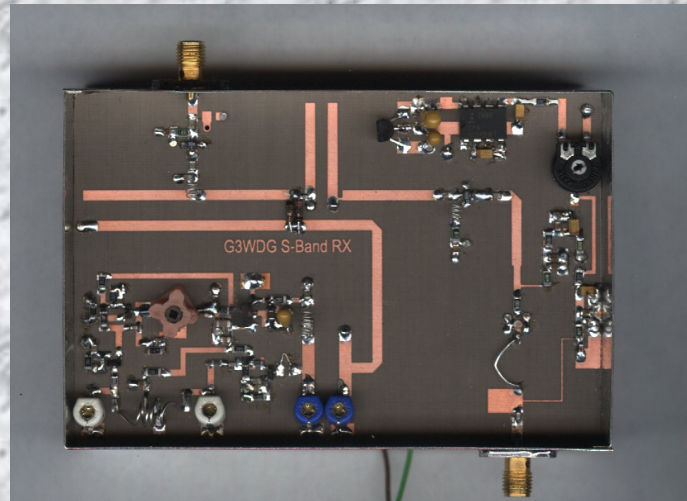
- Feed does not obscure radiated beam
- Slightly elliptical
- Section of a full-size parabolic dish

2.4GHz Downconverter

- Convert 2.4GHz to an Intermediate Frequency (IF)
- Cheap Ex-TV Receive converters can be used
- Modifications can be very simple
- Simple kits can be built
- Ready made converters



9H1LO's Converter



G3WDG Kit Converter



Drake 2880 Ex-TV Converter

Uplink Transmitter

- **SSB 435MHz Transmitter**
- **Between 25w - 100w RF Output**
- **Linear Amplifier could also be used**



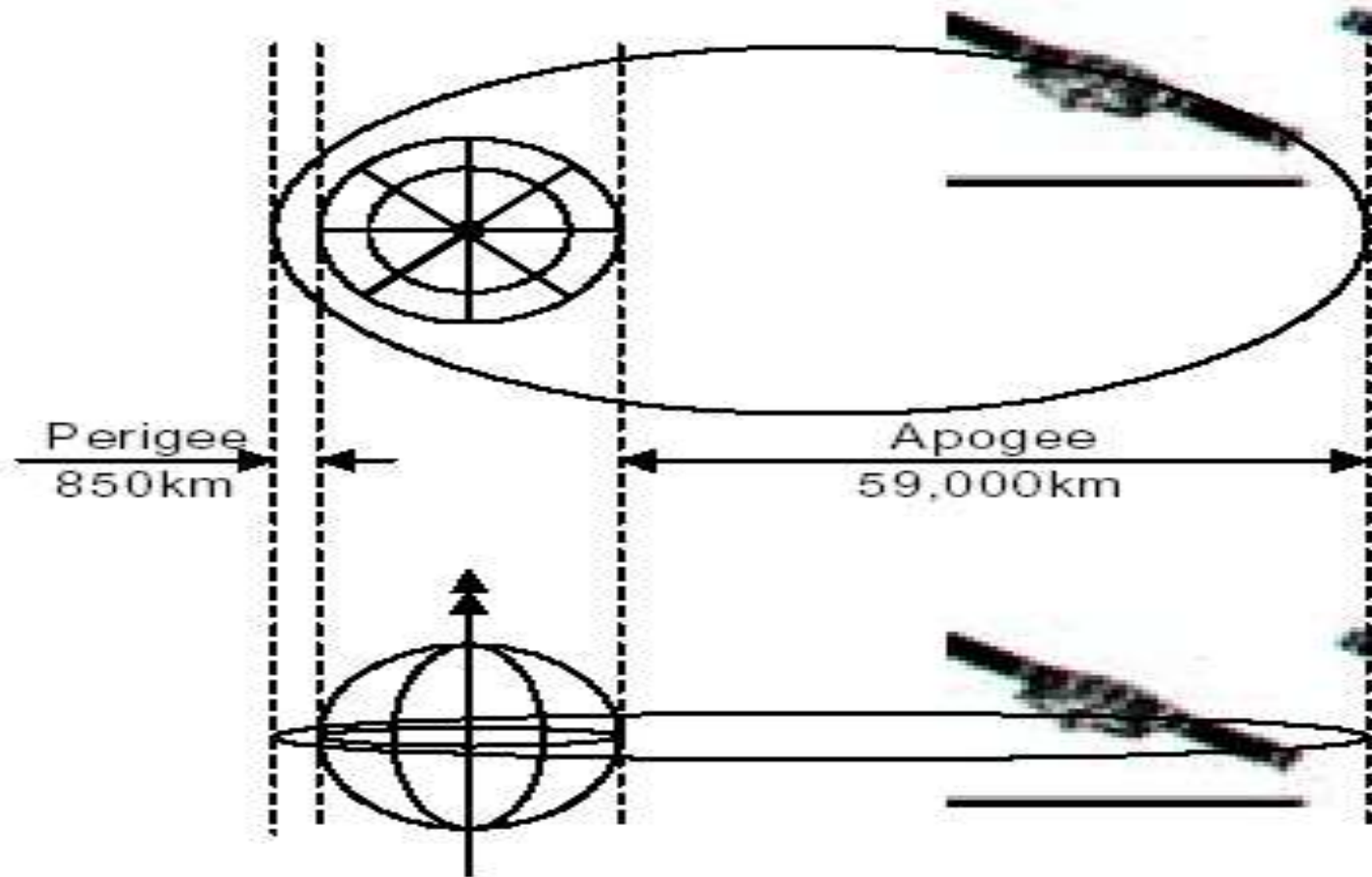
Uplink can also be on 1296MHz

Transmit Antenna

- 435MHz
- >10dBic gain
- 8 to 15 Elements
- At least 250w ERP



AO-40's Orbit



59,000 – 65,000 KM at Apogee
1500 – 850 KM at Perigee

AO-40's footprint



Oscar 40 Activity Demo at the MARL HQ Yard

25th May 2003 starting at 9:30am